Chief 2000 Hertz DC Inverter Welder

USERS MANUAL

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AUTOMOTIVE SYSTEMS

A DOVER INDUSTRIES COMPANY

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CHIEF AUTOMOTIVE SYSTEMS

CHIEF 2000 HERTZ DC INVERTER WELDER
USERS MANUAL

This users manual is written to familiarize operators with the safe and efficient operation of the Chief 2000 Hertz DC Inverter Welder System. This resistance spot welder combines simplicity with multifunctional operations. It is easy to use and its welding functions increase job performance and shop productivity. It may be used with mild steel, galvanized steel or high strength steel.

Prior to using this welding system, all operators must read this entire manual to not only become familiar with the system's components but to also observe all safety, maintenance and troubleshooting precautions.

Chief 2000 Hertz DC Inverter Welder

Standards

All welding machines comply with EC standards and international standards relative to resistance welders and general specifications applicable to all transformers. All electrical components are UL listed.

⚠ General Precautions:

1. Operation and maintenance are to be carried out in compliance with the recommendations listed in this users manual.
2. All operators must be trained in the use of this welder.
3. Only qualified personnel must perform repairs and maintenance.
4. DO NOT attempt to dismantle or heat the gas spring of the gun suspension system.
5. The electrical supply may reach 480 VAC (check voltage on manufacturer's name plate) and is a potential source of danger if this manual's recommendations are not followed.
6. Voltage in the machine may reach 670 VDC (indicated on warning label inside of machine) and is a potential source of danger if this manual's recommendations are not followed.
7. The machine includes capacitors which store electrical power even when the system has been disconnected from power supply. See related precautions - page11.
8. Operator is responsible for ensuring proper care and complying with the car manufacturer's recommendations relating to the protection of electrical, electronic or safety devices (computer, car radios, alarms, air-bags, etc.).
9. Before any maintenance or repairs are made to equipment, electrical power supply must be cut off from the welder by placing main switch (on front of machine) in the "off" position and disconnecting machine from power supply.
10. Before any maintenance or repairs are made to equipment, compressed air supply should be cut off and depressurized.
11. The electrodes, arms and secondary leads may become extremely hot after use and may result in serious burns. Allow these parts to cool before any repairs or maintenance is performed.
12. Follow maintenance recommendations listed in this manual. Repairs should be made immediately and all faulty parts replaced.

⚠ CAUTION:

If precautions in this manual are not observed:

- Personnel will be endangered.
- Welding unit or other property may be damaged.
  Chief Automotive Systems, Inc. is not responsible for any injuries or property loss resulting from operation of this unit under the following circumstances:
  - Modification or neutralization of safety devices.
  - Non-compliance of recommendations as listed in this manual.
  - Modification of equipment.
  - Use of accessories other than those supplied by Chief Automotive Systems, Inc.

⚠ Electrical Precautions

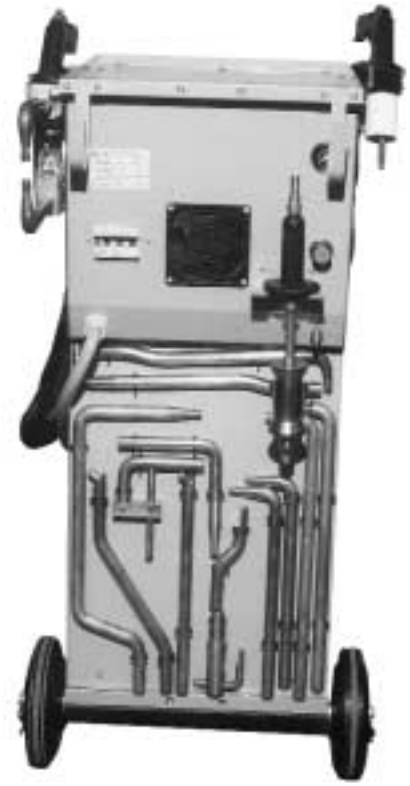
The ground fault circuit interruptor (ground leakage circuit breaker), fuses, gauges, wiring, power points, ground connection, and cut-off devices for the various power supplies, must be in good condition and comply with the connecting power of this machine as indicated on manufacturer's name plate.

⚠ Personnel Precautions.

1. Operators must wear face shield, gloves and non-flammable clothing for protection against sparks.
2. Electrode force may exceed 400 pounds. Keep body clear of welding gun's moving parts.
3. DO NOT wear rings, watches or any objects that may conduct electricity as they can overheat and cause severe burns.
4. Persons with medical implants should not come within 10 feet (3 meters) of the welder or the vehicle being repaired when welder is in use.
5. All of the machine's protective panels must remain in place and be in good condition.
6. Warning labels must remain in place and be in good condition. On request Chief supplies replacement labels.
7. Operators must be knowledgeable of the operation of the welder before beginning work.
8. Work area should be well-lit and free of obstacles with access to emergency stop switch.

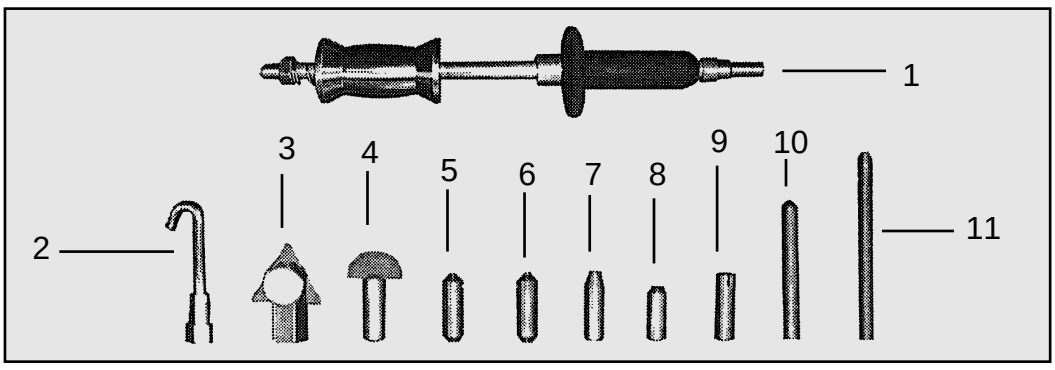
IMPORTANT: In case of non-satisfactory welder operation, read this users manual for proper operating or maintenance information. DO NOT remove panels to look inside of machine. Place main switch to "off" position, disconnect machine from electrical and air power sources and call a Chief authorized representative.

Rear Panel - Chief 2000 Hertz DC InverterWelder



Unit Components (See Illustration Below)

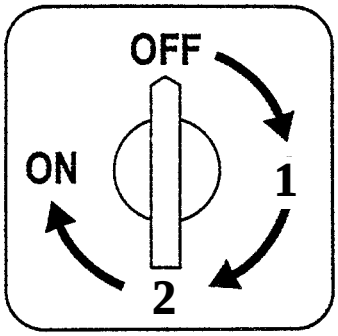
1. Slide hammer.
2. Panel straightening accessory.
3. End piece for dent pulling wedge plates.
4. Electrode for seam welds (series spots)
5. Electrode for stud welds, 2, 5 and 3mm.
6. Electrode for stud welds, 4 and 5mm.
7. Electrode for moulding rivet welds.
8. Electrode for copper shrinking.
9. Electrode for washer welds.
10. Electrode for spot welds and welding of nuts.
11. Carbon electrode for heat shrinking.



Setting Up Welder

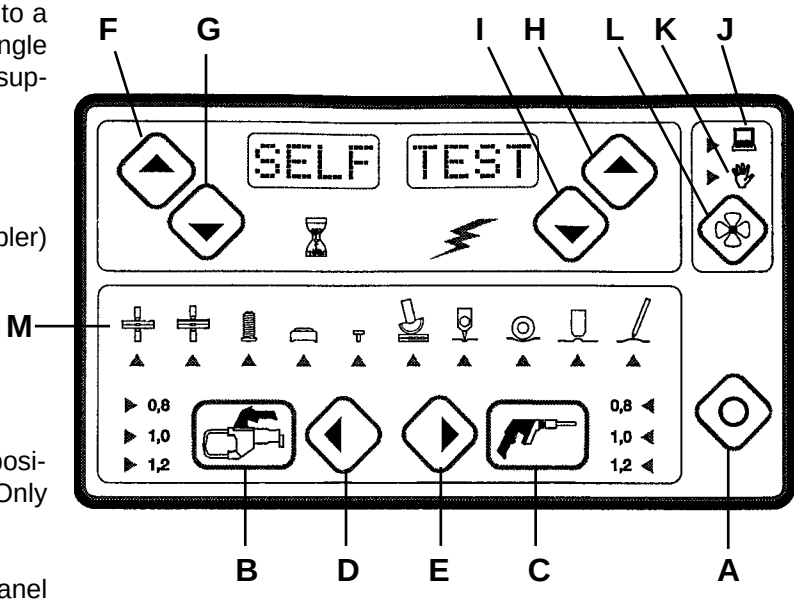
1. Make sure main switch at front of machine and breaker at rear of machine are both in “off” position.
   IMPORTANT: A qualified electrician must perform the following:
   - If machine will be used with three-phase supply, hard wire it to connecting box or plug it to a 208/230 V socket (3 phases + ground) with a minimum power of 50 amps, supplied by leads of at least 10 gauge.
   - If machine will be used on single phase supply, only two of the phase conductors will be used. Each of the three phase conductors are identified by number (1, 2 or 3). For single phase supply, cut the end of conductor number 3 and insulate it. Then hard wire conductors 1 and 2 to a connecting box or to a plug connected to a socket (208 / 230 V - single phase + ground) with a minimum power of 60 A supplied by leads of at least 8 gauge.
2. Drain air supply line.
3. Connect the compressed air hose (with quick coupler) to the air connector on back side of welding unit.
4. Set air pressure of line at 70 psi or 5 BAR.
5. Place breaker at rear of machine in “on” position.
6. Turn main switch on front panel (clockwise) to “on” position. DO NOT leave switch on positions “1” or “2”. Only use “on” and “off”.
7. Press button in lower right hand corner of control panel to switch control unit “on”. (See letter A at right.)
8. Press pincer gun selection key. (See letter B at right.)
9. Operate pincer gun by pulling trigger located under the handle. Electrodes should close. Then press trigger located on top of handle. Electrodes should open wide.

⚠ **CAUTION:** Double-sided gun and single-sided pistol are connected to current output. Welding can only be done when correct gun is used with correct mode setting. However, because the two tools are simultaneously supplied with current, it is important that precautions be followed. When using double sided gun, make sure single sided pistol and ground shoe cable are placed on their supports and can not touch each other. When using welding pistol, the double- sided gun must be placed on its support.



Main Switch At Front Of Machine

Control Panel At Front Of Machine



Control Panel Descriptions

A: Keyboard “on” switch.
B: Selection of pincer gun.
C: Selection of pistol.
D: Job selection scroll to left.
E: Job selection scroll to right.
F: Welding time increase key.
G: Welding time decrease key.
H: Power increase key.
I: Power decrease key.
J: Cable cooling automatic indicator.
K: Cable cooling manual indicator.
L: Cable cooling control mode key.

M: Welding Pictographs (from left to right)
- Welding of mild steel.
- Welding of zinc coated steel.
- Stud welding.
- Nut welding.
- Welding of moulding rivets.
- Seam welding.
- Dent pulling.
- Welding of pulling washers.
- Pulse welding (gun) or bump shrinking (pistol).
- Carbon heat shrinking.

LED near pincer gun and pistol: Thickness of sheet to weld.

Resetting The Machine

All work programs are preset at the factory; however, on any program, welding time and welding current can be modified. Modifications are automatically memorized and will replace factory settings. To recover factory settings, proceed as follows:

1. Turn off main switch.
2. Turn on main switch
3. Before pressing control panel key “on”, press simultaneously the two bottom center keys for selection of job (see items D and E on previous page). While keeping these two keys depressed, press “on” key of control panel. The machine will switch “on” and the message “INIT PARA” will appear briefly on display panel. This indicates the machine has recovered its factory settings and is ready for use.

Welding On Two Sides

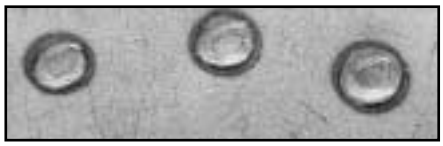
1. Adjust and tighten the arms of the two-sided gun after making sure electrodes are correctly aligned.

2. Set air pressure to 70 psi (5 bar) for 9” arms. Increase pressure by 15 psi for each 4” additional length.

3. Set program and thickness of sheets to be welded. In case of different thicknesses, only consider the thinner sheet. The power and welding time are preset and the parameters will automatically appear on the display. If preset parameters have been changed, set power and time according to the chart at right or reset the timer as indicated at top of this page to recover the original factory settings.

4. Position electrodes where welding is required and pull trigger to complete welding process.
   NOTE: A timer allows the trigger of the two sided gun to be pulled and released during a 1.5 second span without starting the welding process. This allows the operator to reposition the gun on the parts to be assembled. When pulling the trigger longer than 1.5 seconds, the gun remains closed and opens only after the welding process is complete.

5. If electrodes stick to welded area, press button located at top of handle to force the gun open.



Completed welds should appear as per photo at left.

Basic Settings

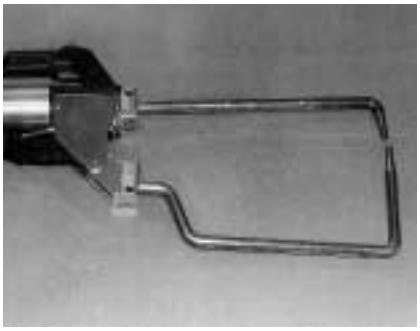
Thinner Sheet	Mild Steel	Zinc Coated	HSS
Thickness	**Tim. - Pow.**	**Tim. - Pow.**	**Tim. - Pow.**
0.8 mm	**14 - 60**	**8 - 65**	**6 - 55**
1.0mm	**18 - 65**	**10 - 70**	**10 - 60**
1.2mm	**20 - 72**	**10 - 77**	**12 - 67**
1.5mm	**24 - 75**	**16 - 80**	**14 - 70**
2.0mm	**30 - 85**	**22 - 85**	**16 - 85**
2.5mm	**36 - 92**	**30 - 95**	**18 - 92**

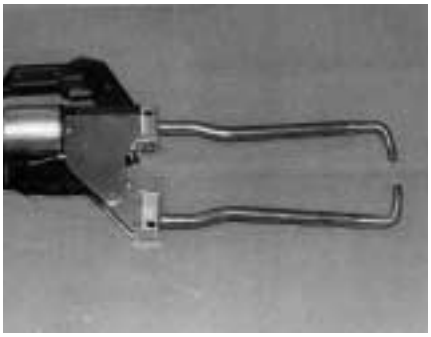
Electrode Alignment:

A special work mode allows closing of gun without starting the welding process to check proper alignment of electrodes. When timer is on and pincer gun has been selected, use “D” Key (see diagram - page 3) to select welding of mild steel (first pictograph at left). Press “D” Key one more time. LED under pictograph will start blinking showing the gun is at “no weld” position. The gun can be closed for 5 seconds by keeping finger on trigger.

Two-Sided Gun And Assorted Electrodes

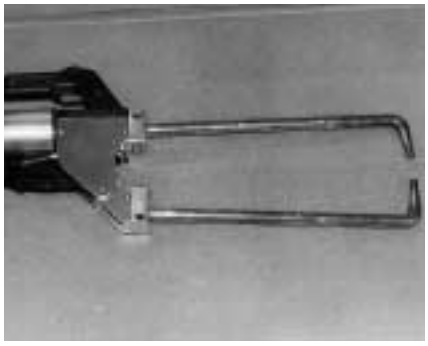
440mm Large Throat Gap

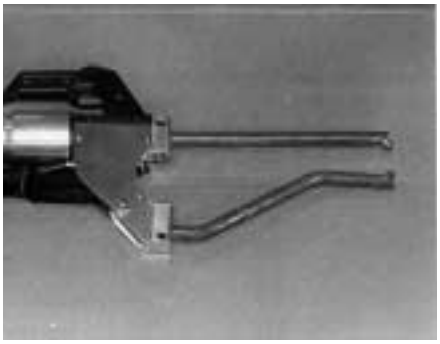




330mm Roof Arm Set

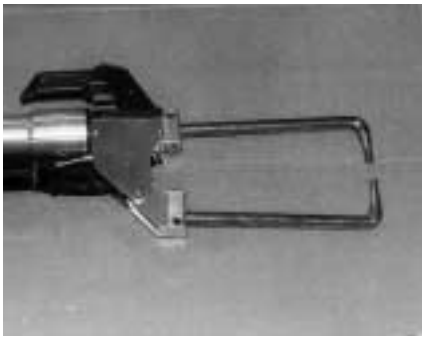
440mm Straight Arm Set

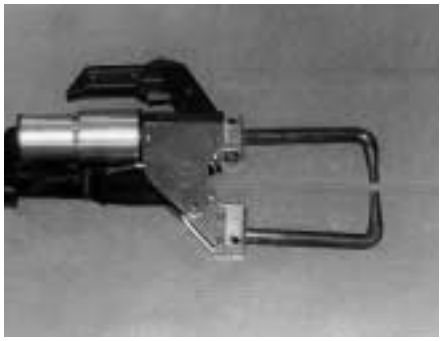




330mm Narrow Throat Gap Arm Set

330mm Straight Arm Set





220mm Straight Arm Set

150mm Wheel Well Arm Set

150mm X-Centered Large Throat Gap Arm Set

Welding On One Side (Pistol)

1. Fit welding electrode to pistol. (See unit components - page 2.)

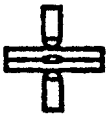
2. Clamp ground shoe to bottom piece of steel prior to welding top piece of steel to bottom piece of steel.
   NOTE: When applying a pistol weld to top piece of steel, the ground shoe must be clamped to the bottom piece of steel to allow a flow of current through the two parts.

3. Select program and thickness of sheets to be welded. If thicknesses are different, only consider the thinner piece of steel.
   NOTE: The power and welding time are preset and parameters will automatically appear on the display. If the preset parameters have been changed set power and time according to the chart at right or reset the timer as indicated on page 4 to recover the original factory settings.

4. Position the electrode at the desired location. It must be positioned perpendicular to the welding location to prevent slippage. Apply sufficient force to prevent any gap between the two parts. Pull trigger of pistol to begin welding process. Release trigger to stop. After welding is completed, hold pistol in place for approximately 2 seconds to create a forging effect and avoid rapid cooling of the spot.

NOTE: Pulsations are not recommended for single side welding except for thick metal. Therefore, for welding of high strength steel, use the same program and same settings as those for zinc coated steel.

Basic Settings

Thinner Sheet	Mild Steel 	Zinc Coated	HSS
Thickness	**Tim.-Pow.**	**Tps - Puls.**	**Tps.-Puls.**
0.8 mm	**16 - 60**	**8 - 65**	**6 - 60**
1.0mm	**18 - 65**	**10 - 70**	**10 - 65**
1.2mm	**24 - 72**	**10 - 77**	**12 - 72**
1.5mm	**28 - 75**	**16 - 80**	**14 - 75**

Seam Welding

IMPORTANT: Seam spot welding does not have the strength of a MIG weld and should never be used for structural welding. Due to its low emission of heat; however, seam spot welding is very useful for patching holes on panels.

1. Fit proper electrode in the pistol. (See unit components - page 2.)

2. Clamp ground shoe to bottom piece of steel prior to welding top piece of steel to bottom piece of steel.
   NOTE: When applying a pistol weld to top piece of steel, the ground shoe must be clamped to the bottom piece of steel to allow a flow of current through the two parts.

3. Select program and thickness of sheets to be welded. If thicknesses are different, only consider the thinner piece of steel.
   NOTE: The power and welding time are preset and parameters will automatically appear on the display. If the preset parameters have been changed set power and time according to the chart at right or reset the timer as indicated on page 4 to recover the original factory settings.

4. Position the electrode at the desired location. Apply moderate pressure and pull the trigger. Hold trigger for approximately three pulses. Then gradually tilt the pistol to the front to begin rolling the electrode. The advance speed is approximately 1 inch per 4 seconds. Control the advance speed by checking the heat.

NOTE: The seam welding process allows operator to weld zinc coated steel and high strength steel with the same program used for welding of mild steel.

Basic Settings	
Top Sheet	All Steel
Thickness	Tim. - Pow.
0.8mm	4 - 55
1.0mm	5 - 60
1.2mm	6 - 70

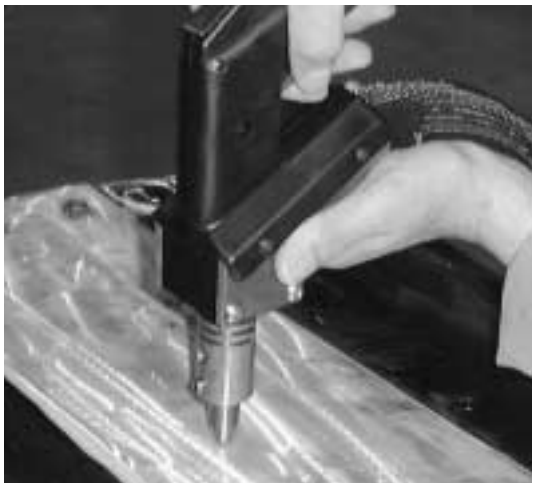
Welding Of Studs, Nuts And Moulding Rivets

1. Fit appropriate electrode in the pistol. (See unit components - page 2.)

2. Clamp ground shoe to steel sheet (panel, etc.) prior to welding a stud, nut or moulding rivet to the steel sheet.
   NOTE: When applying a pistol weld, the ground shoe must be clamped to the steel sheet to allow a flow of current through the component (stud, nut or moulding rivet) and the steel sheet.

3. Select program and thickness of sheet to be welded.
   NOTE: The power and welding time are preset and parameters will automatically appear on the display. If the preset parameters have been changed set power and time according to the chart at right or reset the timer as indicated on page 4 to recover the original factory settings.

4. Position the electrode at the desired location. It must be positioned perpendicular to the welding location to prevent slippage. Apply moderate pressure for nut welding and very low pressure for welding studs and moulding rivets. Pull trigger to weld. The trigger can be released at any time as welding is electronically controlled.



Basic Settings			
	All Steels	All Steels	All Steels
Thickness	Tim.-Pow	Tim.-Pow.	Tim.-Pow
0.8mm	18 - 60	10 - 65	2 - 25
1.0mm	20 - 65	12 - 70	2 - 30
1.2mm	22 - 72	13 - 77	2 - 33
1.5mm	24 - 75	14 - 80	2 - 38
2.0mm	26 - 85	15 - 85	2 - 42
2.5mm	28 - 92	16 - 95	2 - 50

Dent Pulling

1. Fit slide hammer in pistol and fit wedge plate in slide hammer. (See unit components - page 2.)

2. Clamp ground shoe to steel sheet (panel, etc.) prior to welding wedge plate to dented portion of steel sheet.
   NOTE: When welding wedge plate to steel sheet and when pulling the dent, the ground shoe must be clamped to the steel sheet to allow a flow of current through the wedge plate and the steel sheet.

3. Select program and thickness of steel sheet.
   NOTE: The power and time are preset and parameters will automatically appear on the display. If the preset parameters have been changed set power and time according to the chart at right or reset the timer as indicated on page 4 to recover the original factory settings.

4. Position the wedge plate in middle of dent and apply very light pressure. Then pull the trigger.
   IMPORTANT: Too much pressure may result in burning through the panel.

5. Slowly straighten the dent by repeatedly tapping the slide hammer. Then release the trigger and remove the wedge plate by twisting the slide hammer.
   IMPORTANT: Pressure must be constant during the dent removal procedure. Remember, the lighter the force, the greater the adhesion. Too much pressure may result in burning through the panel.

Basic Settings	
	All Steels
Thickness	Tim. - Pow.
0.8mm	2 - 22
1.0mm	2 - 24
1.2mm	2 - 28
1.5mm	2 - 30

Panel Pulling

1. Fit washer weld electrode in pistol. (See unit components - page 2.)

2. Clamp ground shoe to steel sheet (panel, etc.) prior to welding of washer(s) to the steel sheet.
   NOTE: When welding washer(s) to the steel sheet, the ground shoe must be clamped to the steel sheet to allow a flow of current through the washer(s) and the steel sheet.

3. Select program and thickness of sheet to be welded.
   NOTE: The power and welding time are preset and parameters will automatically appear on the display. If the preset parameters have been changed set power and time according to the chart at right or reset the timer as indicated on page 4 to recover the original factory settings.

4. Place washer in the electrode and position electrode at desired location. (See photo below.) Apply light pressure and pull the trigger.
   NOTE: If necessary, weld additional washers making sure they are aligned with each other. (See Step 5.)

5. Use slide hammer equipped with hook tool to pull washers one by one or in a series by inserting a bar (1/4" diameter) through the washers. (See photo at right.)

IMPORTANT: Pressure must be constant during the dent removal procedure. Remember, the lighter the force, the greater the adhesion. Too much pressure may result in burning through the panel.

Basic Settings	
	All Steel
Thickness	Tim. - Pow.
0.8mm	2 - 25
1.0mm	2 - 27
1.2mm	2 - 30
1.5mm	2 - 32

Smoothing Out Bumps

1. Fit proper electrode in the pistol. (See unit components - page 2.)

2. Clamp ground shoe to steel sheet (panel, etc.) prior to smoothing out bumps in steel sheet.
   NOTE: When smoothing out bumps in steel sheet, the ground shoe must be clamped to the steel sheet to allow a flow of current through the electrode and the steel sheet.

3. Select program and thickness of steel sheet used.
   NOTE: The power and welding time are preset and parameters will automatically appear on the display. If the preset parameters have been changed, set power and time according to the chart at right or reset the timer as indicated on page 4 to recover the original factory settings.

4. Place electrode on center of bump and pull the trigger. (See photo at right.) Apply only light pressure at first; however, increase it gradually during pulsations when bump starts to collapse.
   NOTE: Heat can be controlled by the force applied to the bump. The greater the force, the lower the heat. The lighter the force, the greater the heat.

Basic Settings

	All Steels	All Steels
Thickness	**Tim. - Pow.**	**Tim. - Pow.**
0.8mm	**6 - 20**	**- 30**
1.0mm	**6 - 24**	**- 35**
1.2mm	**6 - 30**	**- 40**
1.5mm	**6 - 55**	**- 50**

Carbon Heat Shrinking

1. Fit a carbon pencil in the pistol. (See unit components - page 2.)

2. Clamp ground shoe to steel sheet (panel, etc.) prior to carbon heat shrinking process.
   NOTE: When applying carbon heat shrinking process to steel sheet, the ground shoe must be clamped to the steel sheet to allow a flow of current through the carbon pencil and the steel sheet.

3. Select program and thickness of steel sheets used. If thicknesses are different, only consider the thinner piece of steel.
   NOTE: The power and welding time are preset and parameters will automatically appear on the display. If the preset parameters have been changed set power and time according to the chart above or reset the timer as indicated on page 4 to recover the original factory settings.

4. Position carbon pencil at desired location and pull trigger. Apply spiral movement from outside to inside of zone to be tensioned.
   IMPORTANT: Heating time is limited to 8 seconds. Immediately following application of heat, wet the area. The sudden cooling will shrink the steel.

⚠ Maintenance Precautions:

1. Maintenance must be done by an authorized Chief Automotive Systems, Inc. representative.

2. Respect all safety instructions and warning labels as indicated in this manual.

3. For access to electronic housing, remove the top panel. (See screws located under rubber mat.)

   ⚠ **CAUTION:** Before removing top panel read following section entitled: Supplementary Safety Warnings For Maintenance.

⚠ Supplementary Safety Warnings:

1. Voltage in machine may reach 670 VDC (indicated on warning label inside of machine) and is a potential source of danger if recommendations in this manual are not followed.

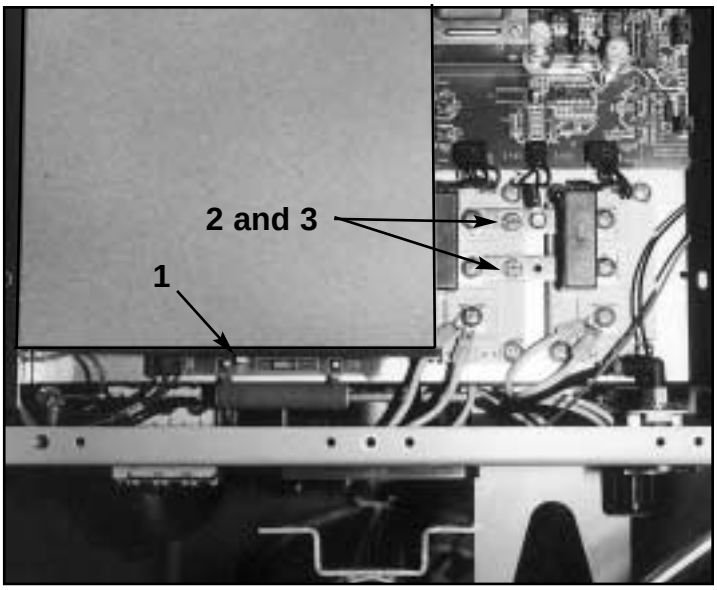
2. This machine includes capacitors which store electrical power even when the system has been disconnected from power supply for a substantial period of time.

3. Before opening top panel of machine, place main switch (located on front of machine) at "off" position and disconnect machine from main power supply. Also, turn off breaker on back of machine. **Both steps are mandatory.**

4. Lower the lighting in the room and remove the panel. (Bright lighting may affect visibility.) **Check LED located on the PCB at rear of machine. (See reference No. 1 in photo above.)** This LED must be off. (No light should be seen.) The presence of light indicates that capacitors are still charged.

5. **If light is not detected in LED, make a safety check by shunting the two aluminum bars. (See reference Nos. 2 and 3 in photo above.)** For this operation, use only an electrician's tool (pincer or screwdriver) insulated up to 1000V. The purpose of this step is to discharge the capacitors in case the LED is defective.

IMPORTANT: These precautions are essential every time the machine has been connected (even for a short period of time) as capacitors can be charged in less than a second. Also, capacitors may remain charged for several days even if the machine has been disconnected.



Specifications

Power Supply.....190 / 230 V - 50 / 60 Hz
3 phase + ground
or single phase + ground

Transformer.....2,000 Hz rectified current

Transformer Class.....H (180° C)

Maximum Welding Power.....47,3 kVA

Thermal Protection.....Yes

Full Load Amps.....60 A

Breaker For Welding Up To 1.5mm Sheet.....40 A Slow Action Type

Breaker For Use Of Full Power Of Machine.....60 A Slow Action Type

Supply Cable Up To 60 Foot Distance (*).....3 x 10 Ga. + Ground (On 3 Phase Use)
From Main Breaker * 3 x 8 Ga. + Ground (On Single Phase Use)

Electrode Force.....375 LBS. At 85 PSI (6 bars)

Dimension (With Pincer And Pistol Bracket)
W x D x H.....27” x 30” x 41”

Total Weight (With All Accessories And Cables).....245 LBS.

***** *Due to low work rate of this type of machine (maximum permanent current = 3 minutes per hour), the admissible wire size is lower than recommended by international standards for this type of breaker as the standards refer to a permanent use.*

Diagnosis And Remedies

Fault	Possible Cause	Remedies
Welding control indicators do not light.	Power supply fault.	Check condition of main power line (unit connection, fuses, main circuit-breaker, etc.). If no power supply problems, call an authorized Chief representative.
Machine's circuit breaker trips.	Weak power supply.	Inadequate electrical supply, too low initial voltage or important drop of voltage during weld results in high supply amperage. Have installation checked (initial voltage, length, size of wire, tightening of connections , etc.). Check condition of main power line (unit connection, fuses, main circuit-breaker, etc.).
Installation circuit breaker trips.	Too low breaker or weak power supply	Same as above. Change breaker to higher amperage type if necessary. (60 amps - slow action type.)
Self test message.	Normal when machine starts.	Wait until machine finishes auto test.
Test OK message.	Normal when machine starts.	Machine is OK ready to work in few seconds.
Init Para message.	Appears after resetting timer.	Procedure has been successful.
Tool err. message.	Wrong tool selected on keyboard.	Select tool being used (gun/pistol) on keyboard.
Curr. Peak message.	Inadequate electrical supply.	Inadequate electrical supply, too low initial voltage or important drop of voltage during weld results in high supply amperage. Have installation checked (initial voltage, length, size of wire, tightening of connections, etc.).
Stop ° F message	Overheating.	Overheated cables, rectifier or transformer. Stop using machine for approximately 30 minutes but let machine run to allow fan to cool. If air does not flow in the cables, select automatic cooling on keyboard.
Gun Sens. message	Faulty gun cable temp. sensor.	Automatic cooling of gun cables may be erratic. Use manual cooling control and call an authorized Chief representative.
Pist. Sens. message	Faulty pistol cable temp. sensor.	Automatic cooling of pistol cables may be erratic. Use manual cooling control and call an authorized Chief representative.
Keyboard Err. message	Faulty keyboard (one key stuck).	Call an authorized Chief representative.
Gun Trig. message.	Faulty gun switch.	Gun switch stuck. Operate trigger to try to release the switch. If no improvement, replace switch.
Pist. Trig. message	Faulty pistol switch.	Pistol switch stuck. Operate trigger to try to release switch. If no improvement, replace switch.

Diagnosis And Remedies.....continued

Fault	Possible Cause	Remedies
Poor quality welds: burnt spots with cavities	Dirty sheets (paint, primer, filler, excessive rust, etc.)	Clean and remove excess paint, filler or rust.
	Too low electrode force.	Increase welding effort.
	Worn electrodes.	Clean, dress or replace electrodes.
	Poor quality welding primer.	Use only high quality zinc welding primer “Saitek Z-Coat”. DO NOT use a copper or aluminum-based primer.
	Wrong settings.	Reduce welding time and increase welding power.
Weak welding current.	Inadequate power supply.	Inadequate electrical supply, too low initial voltage or important drop of voltage during weld resulting in high supply amperage. Have installation checked (initial voltage, length, size of wire, tightening of connections, etc.). Check if several machines are not connected on same line and operating simultaneously.
	Poor connections.	Check that all connections are tight. (Welding cables on gun, pistol and ground and on transformer output.)
	Incorrect ground shoe position.	Make sure ground shoe is close to spot of weld and that it is on bottom sheet and not on sheet where weld is to be completed. Check temperature of sheet between spot of weld and ground shoe. A temperature elevation of approximately 40° F after 4 spots indicates a poor return of current.
Overheating of welding cables	Inadequate cooling.	Check air pressure (70 PSI or 5 bars minimum). Make sure air flows in cable. Let cables cool approximately 15 minutes and place cable cooling control on “manual” to allow air flow from beginning of task if machine has to be used for a long time. On automatic control position, the cooling starts when cables begin to get hot.
	Incorrect settings.	Reduce welding time and increase welding current.
	Damaged electrodes requiring too much current.	Clean, dress or replace electrodes.
	Welding rate too fast.	Reduce welding rate.
Uneven “sticking” of dent pulling electrodes and washers.	Uneven pressure during welding.	Maintain constant pressure.
Steel sheet under ground shoe overheats or burns.	Insufficient contact zone or insufficient pressure under ground shoe.	Current must be spread spread evenly under ground shoe. If steel sheet is thin, place a piece of metal between bottom of steel sheet and bottom jaw of ground shoe clamp to provide a larger contact surface.

Diagnosis And Remedies.....continued

Fault	Possible Cause	Remedies
Single sided weld has a nice appearance but is not consistent.	Incorrect settings.	Reduce welding time and increase welding power.
	Poor location of ground shoe.	Make sure ground shoe is close to spot of weld and that it is on bottom sheet and not on sheet where weld is to be applied. Check temperature of sheet between spot of weld and ground shoe. An elevation of temperature of approximately 40° F after 4 spots indicates a bad return of current.
	Heavy zinc coating of sheets.	Use setting for welding of zinc coated sheet. If necessary, remove some of zinc.
Excessive sparks when welding with pincer gun.	Poor quality welding primer.	Use Saitek Z-Coat primer.
	Insufficient effort of electrodes.	Increase air pressure (70PSI minimum with short arms).

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